Notice No.3

Rules and Regulations for the Classification of Ships, July 2018

The status of this Rule set is amended as shown and is now to be read in conjunction with this and prior Notices. Any corrigenda included in the Notice are effective immediately.

Please note that corrigenda amends to paragraphs, Tables and Figures are not shown in their entirety.

Issue date: November 2018

Amendments to	Effective date	IACS/IMO implementation (if applicable)
Part 3, Chapter 2, Section 3	1 January 2019	N/A
Part 3, Chapter 10, Section 5	1 January 2019	N/A
Part 3, Chapter 11, Section 6	1 January 2019	N/A
Part 3, Chapter 13, Section 12	1 January 2019	N/A
Part 4, Chapter 5, Section 8	1 January 2019	N/A
Part 4, Chapter 11, Sections 1, 7, 8, 9 & 10	1 January 2019	N/A

Part 3, Chapter 2
Materials

■ *Section 3*
Corrosion protection

3.5 External hull protection

~~3.5.3 The arrangement for glands, where cables pass through the shell, are to include a small cofferdam. Cables to anodes are not to be led through tanks intended for the carriage of low flash point oils. Where cables are led through cofferdams or clean ballast tanks of tankers, they are to be enclosed in a substantial steel tube of about 10 mm thickness, *see also Pt 6, Ch 2, 14.10 Requirements for tankers intended for the carriage in bulk*.~~

3.5.3 All equipment is to be suitable for its intended location.

3.5.4 The arrangements for glands, where cables pass through the shell, are to include a small cofferdam.

3.5.5 Cables which pass through ballast tanks are to be enclosed in a steel tube of at least 10 mm thickness.

3.5.6 Cables to anodes are not to pass through tanks intended for the storage of low flash point products; including, but not limited to, oils.

3.5.7 Cables which pass through cofferdams of storage tanks which may contain low flash point products are to be enclosed in a steel tube of at least 10 mm thickness. *See also Pt 6, Ch 2, 14 Electrical equipment for use in explosive gas atmospheres or in the presence of combustible dusts*.

Existing 3.5.4 has been renumbered 3.5.8.

Part 3, Chapter 10
Welding and Structural Details

■ *Section 5*
Structural details

5.2 Arrangements at intersections of continuous secondary and primary members

(Part only shown)

Table 10.5.3 Permissible stresses

Item		Direct stress, in N/mm^2 (*see* Notes 1 and 2)		Shear stress, in N/mm^2 (*see* Note 1)	
		Oil tankers	Other ship types for which oil tanker requirements are not applicable	Oil tankers and ship types where primary member stiffener unconnected	Other ship types for which oil tanker requirements are not applicable
Lug or collar plate and weld	Single	-	-	68,6	98,1
	Double	-	-	83,4 *See* Note 3	
Note 3. When the permissible shear stress is applied in the assessment for the notation **Strengthened to carry cargoes which may liquefy (IMSBC Group A)**, the permissible shear stress shall be divided by *k*, *see Pt 3, Ch 2, 1.2 Steel, 1.2.3*, i.e. $^{\mathbf{83,4}}/_{\mathbf{k}}$ N/mm^2.					

Part 3, Chapter 11
Closing Arrangements for Shell, Deck and Bulkheads

■ *Section 6*
Miscellaneous openings

Existing sub-Section 6.5 has been deleted in its entirety and replaced with the following.

6.5 Side scuttles, windows and skylights

6.5.1 Side scuttles are defined as being round or oval openings with an area not exceeding 0,16 m^2.

6.5.2 Windows are defined as being rectangular openings generally, having a radius at each corner relative to the window size in accordance with a recognised National or International Standard, and round or oval openings with an area exceeding 0,16 m^2.

6.5.3 Deadlights are fitted to the inside of windows and side scuttles while storm covers, of comparable specifications to deadlights, are fitted to the outside of windows, where accessible. Deadlights can be hinged and storm covers can be hinged or portable.

6.5.4 A plan showing the location of side scuttles and windows is to be submitted. Attention is to be given to any relevant Statutory Requirements of the National Authority of the country in which the ship is to be registered.

6.5.5 Side scuttles and windows together with their glasses, deadlights and storm covers if fitted, are to be of an approved design or in accordance with a recognised National or International Standard. The minimum design pressures to which windows and side scuttles are to be designed are to be in accordance with *Pt 3, Ch 8 Superstructures, Deckhouses and Bulwarks* unless otherwise specified by the relevant requirements of *Pt 4 Ship Structures (Ship Types).*

6.5.6 Side scuttles and windows are to comply with the relevant requirements given in *Pt 4 Ship Structures (Ship Types)* for the applicable ship type in conjunction with the requirements of *Pt 3, Ch 11, 6.5 Side scuttles, windows and skylights.*

6.5.7 Side scuttles to spaces below the freeboard deck, or to spaces within the first tier of enclosed superstructures, or to first tier deckhouses on the freeboard deck protecting openings leading below or considered buoyant in stability calculations, are to be fitted with efficient, hinged, inside deadlights.

6.5.8 Deadlights are to be capable of being closed and secured watertight if fitted below the freeboard deck or weathertight if fitted above.

6.5.9 No side scuttle is to be fitted in such a position that its sill is below a line drawn parallel to the freeboard deck at side and having its lowest point 2,5 per cent of the breadth *B* above the load waterline corresponding to the summer freeboard (or timber summer freeboard if assigned), or 500 mm, whichever is the greater distance, *see Figure 11.6.1 Side scuttle positioning.*

6.5.10 If the required damage stability or floatability calculations indicate that the side scuttles would become immersed at any intermediate stages of flooding or the final equilibrium waterline, these are to be of the non-opening type.

6.5.11 Windows are not to be fitted below the freeboard deck, in first tier end bulkheads or sides of enclosed superstructures, or in first tier deckhouses that are considered buoyant in stability calculations or protecting openings leading below.

6.5.12 Where windows are fitted in a deckhouse in the first tier, they are to be provided with strong, hinged, steel, weathertight storm covers. However, if there is an opening leading below deck in this deckhouse, this opening is to be treated as being on an exposed deck and is to be protected as required by *Pt 3, Ch 11, 6.4 Companionways, doors and accesses on weather decks 6.4.2*.

6.5.13 Where windows are permitted in an exposed bulkhead on the weather deck in the forward 0,25 of the load line length, strong external storm covers which can be portable and stored adjacent are to be provided.

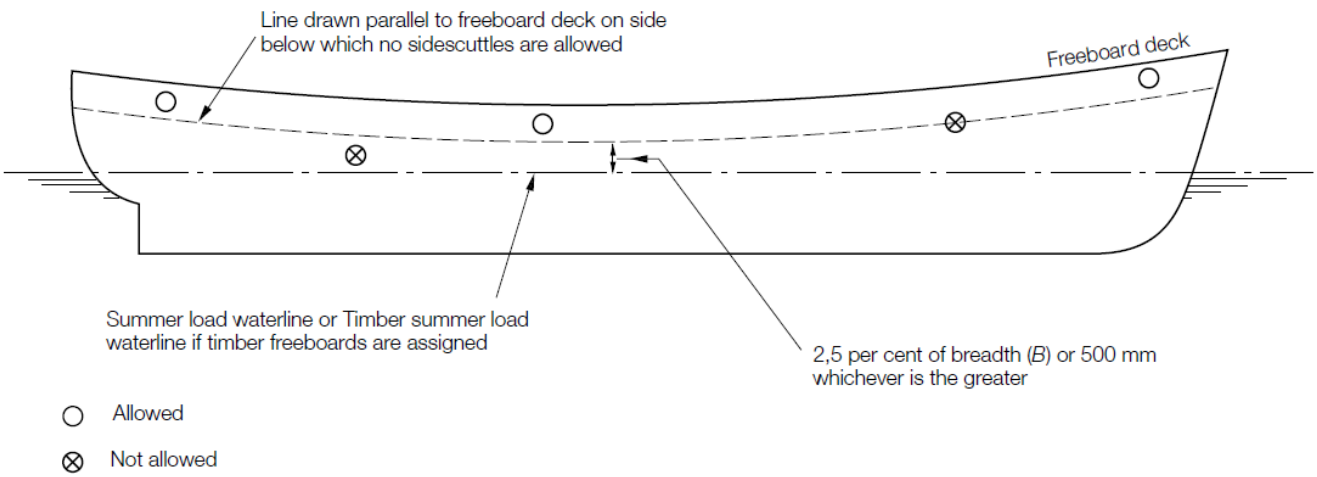


Figure 11.6.1 Side scuttle positioning

6.5.14 Side scuttles and windows at the side shell in the second tier protecting direct access below or spaces considered buoyant in stability calculations are to be provided with efficient inside deadlights capable of being effectively closed and secured weathertight.

6.5.15 Side scuttles and windows set inboard from the side shell in the second tier protecting direct access below to spaces listed in *Pt 3, Ch 11, 6.5 Side scuttles, windows and skylights, 6.5.7*, are to be provided with either efficient hinged inside deadlights or, where they are accessible, permanently attached external storm covers of approved design and of substantial construction and capable of being effectively closed and secured weathertight.

6.5.16 Cabin bulkheads and doors in the second tier separating side scuttles and windows from a direct access leading below may be accepted in place of deadlights or storm covers fitted to the side scuttles or windows.

6.5.17 Side scuttles and windows set inboard from the side shell in the second tier, not protecting direct access below or spaces considered buoyant in the stability calculations, do not require deadlights or storm covers.

6.5.18 If fitted in a deckhouse in the second tier located within the forward 0,25 of the load line length windows are to be provided with strong, hinged, steel, weathertight storm covers. However, if there is an opening leading below deck in this deckhouse, this opening is to be treated as being on an exposed deck and is to be protected as required by *Pt 3, Ch 11, 6.4 Companionways, doors and accesses on weather decks 6.4.2*.

6.5.19 Where the wheelhouse is in the second tier located abaft the forward 0,25 of the load line length, in lieu of storm covers being provided for the wheelhouse windows, a weathertight cover, fitted to a coaming of not less than 230 mm in height around the internal stairway opening within the wheelhouse, can be accepted. If this arrangement is accepted, adequate means of draining the wheelhouse are to be provided.

6.5.20 Deckhouses or superstructure situated on a raised quarter deck or on the deck of a superstructure of less than standard height or on the deck of a deckhouse of less than standard height can be regarded as being in the second tier as far as the provision of deadlights is concerned, provided that the height of the raised quarter deck, superstructure or deckhouse is equal to, or greater than, the standard quarter deck height.

6.5.21 Where the wheelhouse is in the third tier located in the forward 0,25 of the load line length, in lieu of storm covers being provided for the wheelhouse windows, a weathertight cover, fitted to a coaming of not less than 230 mm in height around the internal stairway opening within the wheelhouse, can be accepted. If this arrangement is accepted, adequate means of draining the wheelhouse are to be provided.

6.5.22 Windows at the side shell in the third tier are to be provided with strong portable internal storm covers for 25 per cent of each size of window, with means of securing being provided at each window.

6.5.23 Windows at the side shell in the fourth tier located in the forward 0,25 of the load line length are to be provided with strong portable internal storm covers for 25 per cent of each size of window, with means of securing being provided at each window.

6.5.24 If necessary, for practical considerations, storm covers can be in two parts.

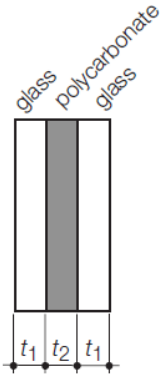
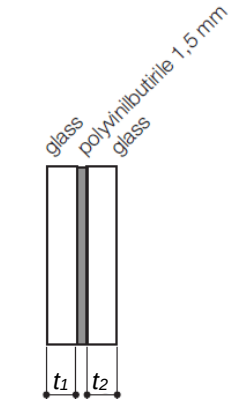
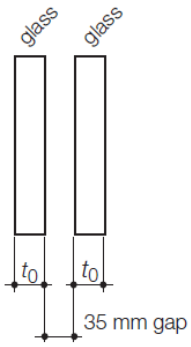
6.5.25 For windows in the second tier and higher above the freeboard deck, a glazing equivalent can be fitted in lieu of deadlights/storm covers. The thicknesses and arrangements are to be acceptable to the National Authority with whom the ship is registered. For arrangements of glazing acceptable to LR, *see Table 11.6.1 Acceptable arrangements of glazing in lieu of portable storm covers/deadlights*. Other glazing equivalents will be considered on a case-by-case basis.

6.5.26 Windows are not to be fitted in machinery space boundaries. However, this does not preclude the use of glass in control rooms within the machinery space.

6.5.27 Skylights, where fitted, are to be of substantial construction and securely attached to their coamings. The height of the lower edge of the opening is to be as required by *Pt 3, Ch 11, 5.1 General 5.1.1.* The scantlings of the coaming are to be as required by this Section or *Pt 3, Ch 11, 5 Hatch coamings*, as appropriate. The thickness of glasses in fixed or opening skylights is to be appropriate to their size and position as required for side scuttles or windows. Glasses in any position are to be protected from mechanical damage and, where fitted in Positions 1 or 2, are to be provided with robust deadlights or storm covers permanently attached. Cargo pump room and machinery space skylights are not to contain glass.

6.5.28 Skylights to cargo pump rooms are to be capable of being closed from outside the pump room.

Table 11.6.1 Acceptable arrangements of glazing in lieu of portable storm covers/deadlights

In lieu of portable storm covers	In lieu of deadlights and storm covers
 $t_1^2 + (0{,}77t_2)^2 + t_1^2 = (1{,}2t_0)^2$	 $t_1^2 + t_2^2 = (1{,}4t_0)^2$ 
Symbols	
t_0 = minimum thickness of toughened glass as required by *Pt 3, Ch 11, 6.5 Side scuttles, windows and skylights 6.5.5*	

Existing Table 11.6.1 has been renumbered 11.6.2.

6.5.29 Laminated toughened safety glass may also be used for windows but the total thickness will need to be greater than that required for the equivalent sized window using toughened safety glass. The equivalent thickness of laminated toughened safety glass is to be determined from the following formula:

$$T_{L1}^2 + T_{L2}^2 + \cdots T_{Ln}^2 = T_s^2$$

where

n = number of laminates
T_{Li} = thickness of glass laminate
T_s = thickness of toughened safety glass

Alternative arrangements that do not meet the above thickness requirement will be specially considered, provided that equivalent strength and bending stiffness to that of a single, thermally toughened pane of thickness, T_s, can be demonstrated in a four-point bending test as described in EN-ISO 1288-3 or an equivalent recognised National or International Standard, using not less than ten samples. The lower limit of the 90 per cent confidence level interval for the laminated pane shall not be less than the same for monolithic toughened safety glass. Small scale punch test or ring-in-ring test methods shall not be used.

6.5.30 Non-metallic frames are not acceptable for windows in the first and second tiers, and are not generally acceptable in any other position in external casings. Any proposals to fit non-metallic frames are to be submitted for consideration, and are to be acceptable to the Administration. The proposed locations, frame dimensions, glass thicknesses and the results of any tests carried out, are to be forwarded.

Part 3, Chapter 13
Ship Control Systems

■ *Section 12*
Emergency towing arrangements

12.1 Structural requirements

~~12.1.1 For ships equipped with emergency towing arrangements in accordance with *IMO Resolution MSC.35(63) - Adoption of Guidelines for Emergency Towing Arrangements on Tankers - (adopted on 20 May 1994)Amended by Resolution MSC.132(75)*, the deck and its supporting structure in way of strongpoints and fairleads are to be suitably reinforced to resist design loads of at least 1,3 x specified breaking strength of the weakest component of the emergency towing arrangement, for angles of tow as specified in *IMO Resolution MSC.35(63) - Adoption of Guidelines for Emergency Towing Arrangements on Tankers - (adopted on 20 May 1994)Amended by Resolution MSC.132(75)*. The deck in way of strongpoints and fairleads is to have a minimum thickness of 15 mm.~~

12.1.1 This Section applies to ships equipped with emergency towing arrangements in accordance with *IMO Resolution MSC.35(63) - Adoption of Guidelines for Emergency Towing Arrangements on Tankers - (adopted on 20 May 1994) Amended by Resolution MSC.132(75)*.

12.1.3 The design load for strong points and associated fairleads shall be at least the specified breaking strength of the weakest component of the emergency towing arrangement, for angles of tow as specified in *IMO Resolution MSC.35(63) - Adoption of Guidelines for Emergency Towing Arrangements on Tankers - (adopted on 20 May 1994) Amended by Resolution MSC.132(75)*.

12.1.4 The deck and its supporting structure in way of strongpoints and fairleads are to be suitably reinforced to resist design loads of at least 1,3 times the specified breaking strength of the weakest component of the emergency towing arrangement, for angles of tow as specified in *IMO Resolution MSC.35(63) - Adoption of Guidelines for Emergency Towing Arrangements on Tankers - (adopted on 20 May 1994) Amended by Resolution MSC.132(75)*. The deck in way of strongpoints and fairleads is to have a minimum thickness of 15 mm.

~~12.1.3~~ 12.1.5 Stresses induced in the strongpoints, fairleads and associated ship supporting structure ~~supporting structure and welds in way of strongpoints and fairleads~~, determined using the design loads from *Pt 3, Ch 13, 12.1 Structural requirements ~~12.1.1~~ 12.1.3* and *Pt 3, Ch 13, 12.1 Structural requirements 12.1.4 as appropriate*, are not to exceed the permissible values given in *Table 13.12.1 Permissible stress values*. The capability of the structure to withstand buckling is also to be assessed.

12.1.6 The weld between the fittings and the deck shall be capable of resisting the design load specified in *Pt 3, Ch 13, 12.1 Structural requirements 12.1.3*.

~~12.1.4~~ 12.1.7 The structural arrangement is to be such that continuity will be ensured. Abrupt changes of shape or section, sharp corners and other points of stress concentration are to be avoided.

12.1.8 Designs of emergency towing arrangements shall be prototype-tested as required by the *IMO Resolution MSC.35(63) - Adoption of Guidelines for Emergency Towing Arrangements on Tankers - (adopted on 20 May 1994)Amended by Resolution MSC.132(75)*.

Part 4, Chapter 5
Barges and Pontoons

Existing Section 8 has been renumbered Section 9.

■ *Section 8*
Towing fittings

8.1 Smit-Type towing brackets and closed fairleads

8.1.1 This sub-Section applies to the typical Smit-Type towing brackets and closed fairleads installed on board manned or unmanned non-self-propelled ships which are part of the envisaged towing arrangement.

8.1.2 The design load for Smit-Type brackets and closed fairleads shall be no less than 1,3 times the minimum breaking strength of the provided towline or of the weakest component in the envisaged towing arrangement if that is lower, applied at all possible angles of tow.

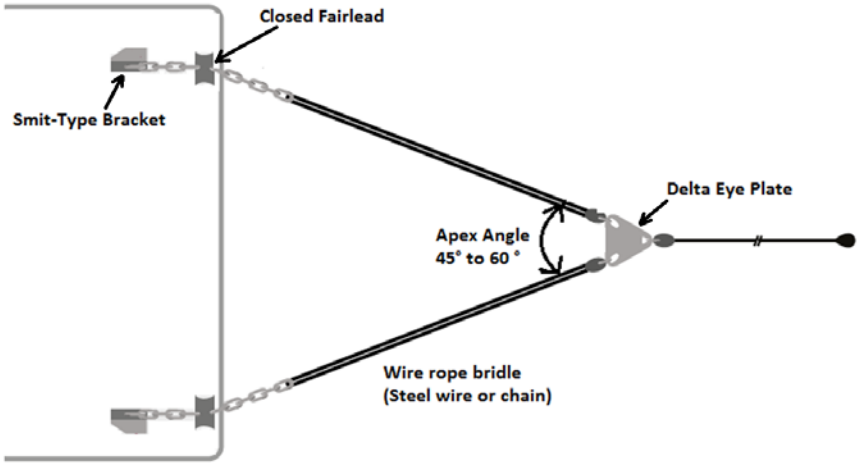


Figure 5.8.1 Illustration of apex angle in a towing arrangement

8.1.3 When towed using a bridle arrangement, the angle at the apex of the bridle shall normally be between 45° and 60° as shown in *Figure 5.8.1 Illustration of apex angle in a towing arrangement*. If it exceeds 60°, then the design load for Smit-Type brackets and closed fairleads specified in *Pt 4, Ch 5, 8.1 Smit-Type towing brackets and closed fairleads 8.1.2* shall be increased to account for the increased resolved load in the bridle.

8.1.4 The Smit-Type brackets and closed fairleads shall be selected from an industry standard accepted by LR based on the design load specified in *Pt 4, Ch 5, 8.1 Smit-Type towing brackets and closed fairleads, 8.1.2* or *Pt 4, Ch 5, 8.1 Smit-Type towing brackets and closed fairleads 8.1.3* as appropriate, applied at all possible angles of tow.

8.1.5 When the Smit-Type brackets or the closed fairleads are not selected from an industry standard accepted by the society, the strength of fittings is to be adequate for the design load specified in *Pt 4, Ch 5, 8.1 Smit-Type towing brackets and closed fairleads 8.1.2* or *Pt 4, Ch 5, 8.1 Smit-Type towing brackets and closed fairleads 8.1.3* as appropriate, applied at all possible angles of tow. Under the design load and with net scantlings, the stresses are not to exceed those given in *Table 5.8.1 Permissible stress values*. Non-linear analysis is considered acceptable subject to special consideration.

Table 5.8.1 Permissible Stress Values

	Permissible stress N/mm^2
Normal stress	σ_0
Shear stress	$\frac{\sigma_0}{\sqrt{3}}$
Combined stress	σ_0
Symbols	
σ_0 = specified minimum yield stress, in N/mm^2 Note: Normal stress is defined as the sum of bending and axial stresses, with the corresponding shearing stress acting perpendicular to the normal stress.	

8.1.6 Prototype testing will be required to confirm the strength unless the Smit-Type bracket or the closed fairlead is selected from a recognised National or International Standard. The fitting shall be tensioned to its design load as specified in *Pt 4, Ch 5, 8.1 Smit-Type towing brackets and closed fairleads 8.1.2* or *Pt 4 Ch 5, 8.1 Smit-Type towing brackets and closed fairleads 8.1.3* as appropriate, accounting for all possible angles of tow. After the test, the prototype needs to be examined for any failures including unacceptable deformations. The prototype which was strength-tested shall not be installed on board.

8.1.7 The weld between the fittings and the deck shall be capable of resisting the design load specified in *Pt 4, Ch 5, 8.1 Smit-Type towing brackets and closed fairleads 8.1.2* or *Pt 4, Ch 5, 8.1 Smit-Type towing brackets and closed fairleads 8.1.3* as appropriate.

8.1.8 The deck and the supporting structure in way of the fittings are to be suitably reinforced to resist a design load specified in *Pt 4, Ch 5, 8.1 Smit-Type towing brackets and closed fairleads 8.1.2* or *Pt 4, Ch 5, 8.1 Smit-Type towing brackets and closed fairleads 8.1.3* as appropriate, applied at all possible angles of tow. Stresses induced in the supporting structure, determined using the design load and with net scantlings are not to exceed the permissible values given in *Table 5.8.1 Permissible stress values*. The capability of the structure to withstand buckling is also to be assessed, and an appropriate insert plate needs to be provided where necessary.

8.1.9 An allowance for corrosion is to be added to the net thickness derived as indicated below:

- For the supporting deck structure, a corrosion addition of 2 mm is to be added to the net thickness derived.
- For fittings not selected from an accepted industry standard, 2 mm is to be added to the net thickness derived.

8.1.10 In addition to the corrosion requirements specified in *Pt 4, Ch 5, 8.1 Smit-Type towing brackets and closed fairleads, 8.1.9*, the wear allowance for the shipboard fittings not selected from an accepted industry standard is not to be less than 1,0 mm, added to the surfaces which are intended to be in regular contact with the towline.

Part 4, Chapter 11
Ore Carriers

■ *Section 1*
General

1.2 Structural configuration and ship arrangement

1.2.3 The notation **Strengthened to carry cargoes which may liquefy (IMSBC Group A)** is only applicable to ore carriers having a conventional structural configuration with cargo holds bounded by two longitudinal bulkheads widely separated from the side shell, *see Figure 11.1.1 Typical cross-section*.

1.3 Class notation

1.3.3 Where a vessel is built in accordance with the requirements detailed in this Section, the vessel will be eligible for the notation **Strengthened to carry cargoes which may liquefy (IMSBC Group A)**. The requirements in this Section do not allow the loading of cargo with moisture content in excess of the transportable moisture limit (TML), as defined in the IMSBC Code, but instead make allowance for the rise in moisture content of the cargo above the TML after loading. Attention is drawn to Section 7.3.2.1 of the IMSBC Code.

1.3.4 The notation **Strengthened to carry cargoes which may liquefy (IMSBC Group A)** serves to identify the ship as being specially constructed for loads from Group A cargoes, as defined in the IMSBC Code. To be eligible for this notation, the following structures are to be assessed, taking the greater of the calculated scantlings:

(a) The longitudinal bulkheads:
  (i) by applying cargo pressure according to *Pt 4, Ch 9, Table 9.6.1 Inner hull and longitudinal oiltight bulkhead scantlings*;
    - For the loading condition full load/partially filled.
    - The density used for the full load/partially filled condition is to be agreed between the Owner and Builder and is to be noted in the Loading Manual by stating 'Carriage of cargo with moisture content above TML shall only be undertaken if the cargo density is above <density> tonne/m^3.'
    - The results are to be corrected for density by applying a factor of $\rho_c/_{1,025}$ to the load height.
  (ii) by applying ballast water content according to *Pt 4, Ch 9, Table 9.6.1 Inner hull and longitudinal oiltight bulkhead scantlings* for cargo hold boundaries assessed for full ballast hold filling;
  (iii) by applying cargo pressure according to *Pt 4, Ch 11, 7.1 General 7.1.2:*
    - For the loading conditions full load/fully filled and full load/partially filled.
    - The cargo density used for the full load/fully filled condition is a virtual density based on homogeneous load at maximum draught.
    - The density used for the full load/partially filled condition is to be agreed between the Owner and Builder and is to be noted in the Loading Manual by stating 'Carriage of cargo with moisture content above TML may only be undertaken if the cargo density is above <density> tonne/m^3.'
    - With K_c = 1.

(b) Intersection of continuous secondary and primary members according to *Pt 3, Ch 10, 5.2 Arrangements at intersections of continuous secondary and primary members* using loads in the same section from *Table 10.5.1 Total load transmitted to connection of secondary members* with K_c = 1.

(c) Cross ties in wing tanks as per requirements in this Chapter.

(d) Transverse bulkheads:
  (i) by applying cargo pressure according to *Table 9.7.1 Transverse oiltight bulkheads scantlings*;
    - For the loading condition full load/partially filled.
    - The density used for the full load/partially filled condition is to be agreed between the Owner and Builder and is to be noted in the Loading Manual by stating "Carriage of cargo with moisture content above TML may only be undertaken if the cargo density is above <density> tonne/m^3.".
    - The results are to be corrected for density by applying a factor of $\rho_c/_{1,025}$ to the load height.
  (ii) by applying ballast water content according to *Table 9.6.1 Inner hull and longitudinal oiltight bulkhead scantlings* for cargo hold boundaries assessed for full ballast hold filling.
  (iii) by applying cargo pressure according to *Pt 4, Ch 11, 8.3 Transverse watertight bulkheads in centre holds:*
    - for the loading conditions full load/fully filled and full load/partially filled.
    - The cargo density used for the full load/fully filled condition is a virtual density based on homogeneous load at maximum draught.
    - The density used for the full load/partially filled condition is to be agreed between the Owner and Builder and is to be noted in the Loading Manual by stating "Carriage of cargo with moisture content above TML may only be undertaken if the cargo density is above <density> tonne/m^3."
    - With K_c = 1.

(e) Lower stool as per requirements for (d) Transverse bulkheads.

Additionally, the vessel is to be designed in accordance with LR's *ShipRight Procedure Additional Design procedures, Procedure for Assessment of Ore Carriers filled with Liquefied Cargoes*.

Existing paragraph 1.3.3 has been renumbered 1.3.5.

1.3.6 For ore carriers where an assessment of multiple port loading and unloading has been carried out in accordance with the relevant ShipRight procedures and the ShipRight notation **SDA** has been assigned, an optional ShipRight notation **MP** can be assigned.

Existing paragraphs 1.3.4 and 1.3.5 have been renumbered 1.3.7 and 1.3.8.

■ *Section 7*
Longitudinal bulkheads

7.1 General

7.1.3 Cargo hold boundary scantlings are to be additionally assessed against ore loading in accordance with *Table 11.7.1 Longitudinal and transverse bulkhead scantlings for ore loading* with load cases as specified in *Pt 4, Ch 11, 1.3 Class notation 1.3.5* for a vessel eligible for the notation **Strengthened to carry cargoes which may liquefy (IMSBC Group A)**.

Existing paragraphs 7.1.3 to 7.1.5 have been renumbered 7.1.4 to 7.1.6.

Table 11.7.1 Longitudinal and transverse bulkhead scantlings for ore loading

Item	Longitudinal and transverse bulkhead
Plate thickness including corrugations (mm)	$t = 0{,}004sf\sqrt{\frac{K_c H k}{C}} + 3{,}5$ mm
Modulus of rolled and built stiffeners, and symmetrical corrugations (cm^3)	$Z = \frac{skK_c H l_e^2}{22C\gamma(\omega_1+\omega_2+2)}$ cm^3
Symbols	
s, S, k, l as defined in *Pt 4, Ch 1, 1.5 Symbols and definitions 1.5.1*	
f = 1,1 – s/2500S but not to be taken greater than 1,0	
l_e = effective length of stiffening member, in metres, and for bulkhead stiffeners, to be taken as $l - e_1 - e_2$	
γ = 1,4 for rolled or built sections and double plate bulkheads	
= 1,6 for flat bars	
= 1,1 for symmetrical corrugations of deep tank bulkheads	
= 1,0 for symmetrical corrugations of watertight bulkheads	
ω, e = as defined in *Table 1.9.3 Bulkhead end constraint factors* in Chapter 1, *see also Figure 1.9.1 End connections*. Where applicable the value of M_2 is to be taken as	
$= \frac{K_c H s l^2}{22C}$	
K_c = ore pressure coefficient, to be taken as $\cos^2 \alpha + (1 - \sin \psi) \sin^2 \alpha$ for inner side (hopper tank, transverse and longitudinal bulkheads, lower stool, vertical upper stool, etc.), and where:	
K_c = 0 for top side tank, upper deck and sloped upper stool	
= 1 in the assessment for the notation **Strengthened to carry cargoes which may liquefy (IMSBC Group A)**	
α = angle, in degrees, between panel considered and the horizontal plane	
ψ = assumed angle of repose, in degrees, of bulk cargo (considered drained and removed); in the absence of more precise evaluation to be taken as ψ = 35° for iron ore	
H = height, from position under consideration to deck at side amidships, in metres	
C = stowage rate, in m^3/tonne, as defined in *Pt 3, Ch 3, 5.2 Symbols*. For vessels where *Pt 4, Ch 11, 1.1 Application 1.1.5* is applicable, C is to include the cargo overshoot specified in *Pt 4, Ch 11, 12.4 Cargo loading conditions for design assessment 12.4.1(e)*	

■ *Section 8*
Transverse bulkheads

8.3 Transverse watertight bulkheads in centre holds

8.3.5 For vessels eligible for the notation **Strengthened to carry cargoes which may liquefy (IMSBC Group A),** the plate thickness of corrugated bulkheads in any cargo hold shall be determined based on differential pressure between liquefied cargo and dry cargo in the adjacent hold.

■ *Section 9*
Primary structure in wing tanks

9.3 Cross ties in wing tanks

9.3.1 Cross ties in wing tanks are to comply with requirements in *Pt 4, Ch 9, 9 Primary members supporting longitudinal framing*.

9.3.2 Cross ties in wing tanks of vessels eligible for the notation **Strengthened to carry cargoes which may liquefy (IMSBC Group A)** are to comply with the requirements in:

- *Pt 4, Ch 9, 9.3 Girders and floors in double bottom 9.3.3*;
- *Pt 4, Ch 9, 9.3 Girders and floors in double bottom 9.3.4;* and
- *Pt 4, Ch 9, 9.3 Girders and floors in double bottom 9.3.5*.
- *LR's ShipRight Additional Design Procedure (ADP), Procedure for Assessment of Ore Carriers filled with Liquefied Cargoes*.

9.3.3 Actual wing tank cross tie area, A_{cl}, in cm^2, is to satisfy:

$A_{cl} \geq f_{liq} A_c$

Where:

A_c Area of cross tie, in cm^2, *see Pt 4, Ch 9, 9.6 Cross-ties 9.6.1*

$f_{liq} = 0{,}5 + \frac{f_p}{2{,}05\ C}$ and is not to be taken less than 1,0.

Where:

C stowage rate, in m^3/tonne

The stowage rate is defined in *Table 11.7.1 Longitudinal and transverse bulkhead scantlings for ore loading* but need not take into account the cargo overshoot defined in *Pt 4, Ch 11, 12.4 Cargo loading conditions for design assessment 12.4.1(e)*.

f_p = 1,0

If the cargo density of the intended loading condition is higher than the virtual cargo density of the fully filled/full load density with homogeneous load at maximum draft then f_p is the be taken as (*see also Pt 4, Ch 11, Class notation 1.3.4*):

$f_p = \frac{C\ h_p\ \rho_p}{h_c}$ but is not to be taken less than 0,0 and need not be taken greater than 1,0.

Where:

ρ_p The full load/partially filled loading condition density (*see Pt 4, Ch 11, Class notation 1.3.4*), t/m^3

h_p the distance from the centre of the cross tie to the level cargo surface of partial filling of the maximum cargo mass, m, of the The full load/partially filled loading condition density (see 1.3.4) in an upright condition. The maximum cargo mass need not take into account the cargo overshoot defined in *Pt 4, Ch 11,12.4 Cargo loading conditions for design assessment 12.4.1(e)*.

h_c vertical distance from the centre of the cross-ties to deck at side amidships, in metres.

9.3.4 Cross tie flange thickness t_f, in mm, is not to be less than:

$$t_f \geq \frac{b_f}{24\sqrt{k f_a}}$$

Where:

f_a $= \frac{A_{cl}}{f_{liq} A_c}$

A_{cl} actual wing tank cross tie area, in cm^2

A_c wing tank cross tie area in cm^2, *see Pt 4, Ch 9, 9.6 Cross-ties 9.6.1*

f_{liq} scantling factor for cargo with moisture level exceeding TML, *see Pt 4, Ch 9, 9.3 Girders and floors in double bottom 9.3.3*

b_f flange breadth of cross tie, in mm.

9.3.5 Length of cross tie, S_c, as defined in *Pt 4, Ch 9, 9.2 Symbols 9.2.1*, is to be less than or equal to l_{perm}:

$S_c \leq l_{perm}$

Where:

l_{perm} permissible length of cross tie, in metres, from the torsional buckling aspect:

$$= \frac{0{,}038\ b_f \sqrt{k\ f_a}}{\sqrt{1 + \frac{d_w\ t_w}{6\ b_f\ t_f}}}$$

f_a $= \frac{A_{cl}}{f_{liq} A_c}$

A_{cl} actual wing tank cross tie area, in cm^2

A_c wing tank cross tie area in cm^2, *see Pt 4, Ch 9, 9.6 Cross-ties 9.6.1*

f_{liq} scantling factor for cargo with moisture level exceeding TML, *see Pt 4, Ch 9, 9.3 Girders and floors in double bottom 9.3.3*

d_w web depth of cross tie, in mm

t_w web thickness of cross tie, in mm

b_f flange breadth of cross tie, in mm

t_f flange thickness of cross tie, in mm.

Existing sub-Sections 9.3 to 9.7 have been renumbered 9.4 to 9.8.

■ *Section 10* **Structural details**

10.1 Intersection of continuous secondary and primary members

10.1.1 For vessels eligible for the notation **Strengthened to carry cargoes which may liquefy (IMSBC Group A)**, the arrangement at the intersection of longitudinal stiffeners on the longitudinal bulkhead and hopper plate with transverse primary members are to comply with *Pt 3, Ch 10, 5.2 Arrangements at intersections of continuous secondary and primary members* and *Table 10.5.1 Total load transmitted to connection of secondary members* with K_c = 1,0.

Existing Sections 10 to 12 have been renumbered 11 to 13.

Published by Lloyd's Register Group Limited
Registered office (Reg. no. 08126909)
71 Fenchurch Street, London, EC3M 4BS
United Kingdom